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**The**  
**Imperial Forestry Institute**  
**University of Oxford**

**TENTH ANNUAL REPORT**  
**1933—1934**  
**AND**  
**PROSPECTUS**

**Oxford**  
**THE HOLYWELL PRESS, LTD.**

**1934**





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# IMPERIAL FORESTRY INSTITUTE

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\*The Board suffered a serious loss in the death, on June 6th, 1934, of Sir Walter Buchanan-Riddell, who had been a member since 1927, and whose services had been of great value to the Institute.

# UNIVERSITY OF OXFORD

## TENTH ANNUAL REPORT OF THE IMPERIAL FORESTRY INSTITUTE FOR THE YEAR 1933—34

### I. ADMINISTRATION.

As a result of negotiations between the University and the contributing Departments in regard to the future control of the Institute, the Board of Governors, as constituted since 1924, ceased to exist at the end of the year. In future the affairs of the Institute will be in the hands of a University Committee on which the contributing Departments will be represented.

### II. STAFF.

2. The following was the constitution of the staff during the year :—

#### DIRECTOR.

Professor R. S. TROUP, C.M.G., C.I.E., M.A., D.Sc. (Oxon.), F.R.S.

#### LECTURERS AND DEMONSTRATORS.

*Silviculture*: THE DIRECTOR; R. BOURNE, M.A. (Oxon.); J. MACDONALD,\*† B.Sc. (Edin.).

*Forest Economics and Policy*: THE DIRECTOR; R. BOURNE, M.A.

*Forest Management*: R. BOURNE, M.A.

*Pathology (Mycology)*: W. R. DAY, B.Sc., M.A. (Oxon.); T. R. PEACE, M.A. (Cantab.).

*Structure and Properties of Wood*: L. CHALK, M.A., D.Phil. (Oxon.); Miss M. M. CHATTAWAY, B.Sc., M.A. (Oxon.); C. L. STOCKER, B.A. (Oxon.) (till April).

*Forest Zoology*: R. N. CHRYSTAL, D.Sc. (Edin.), Hon. M.A. (Oxon.); J. M. B. BROWN, B.Sc. (Belfast).

*Forest Botany*: J. BURTT DAVY, M.A. (Oxon.), Ph.D. (Cantab.); A. C. HOYLE, B.Sc., M.A. (Oxon.).

*Surveying*: M. O'C. TANDY,\* D.S.O., O.B.E., M.A. (Oxon.).

*Forest Engineering and Utilization*: A. H. LLOYD, M.C., M.A. (Oxon.).

*Acting Secretary*: Miss K. ALLISON-BROWN, B.A. (Oxon.).

*Librarian*: Miss G. GUINEY.

\* Part-time Lecturers.

† Forestry Commission Research Officer attached to the Institute.

3. The staff remained the same as in the previous year, except that for financial reasons the services of Mr. C. L. Stocker, of the Wood Structure Section, were terminated during the year. For the same reason, the lectureships in Physiology, Soil Science, Forest Economics, and Forest Law continued in abeyance, and special arrangements had to be made to deal with these branches of work. The lack of an adequate staff continues to impair the efficiency of the Institute and to impose a severe burden on those members who are called on to undertake extra duties.

4. Although not salaried members of the staff, Dr. Helen Bancroft and Miss J. Dickson continued to work at the Institute on problems of wood structure and systematy. An account of their work during the year is given in paragraphs 32, 34, 35, and 43. The continuation of Dr. Bancroft's work has been made possible by a grant from the Christopher Welch Fund, while a small grant for the purchase of instruments has been made to her by the British Association. The work of Miss M. M. Chattaway, of the Section of Wood Structure, has also been materially assisted by a grant from the Christopher Welch Fund.

### III. STUDENTS.

5. *Number and Classification.* The number of students attending courses of study for the whole year or for shorter periods was twenty-one. These may be classified as follows:—

|                             |                  |     |   | Total<br>1933-34. | Average of<br>previous<br>5 years. |
|-----------------------------|------------------|-----|---|-------------------|------------------------------------|
| POST-GRADUATE PROBATIONERS. |                  |     |   |                   |                                    |
| Colonies :                  | Cyprus ...       | ... | 1 |                   |                                    |
|                             | Gold Coast ...   | ... | 2 |                   |                                    |
|                             | Nigeria ...      | ... | 1 |                   |                                    |
|                             | Sierra Leone ... | ... | 1 |                   |                                    |
|                             | Unspecified ...  | ... | 3 |                   |                                    |
|                             |                  |     | — | 8                 | 8.6                                |
| FOREST OFFICERS ON LEAVE.   |                  |     |   |                   |                                    |
| Colonies :                  | British Honduras |     | 1 |                   |                                    |
|                             | Kenya ...        | ... | 1 |                   |                                    |
|                             | Nyasaland ...    | ... | 1 |                   |                                    |
|                             | Trinidad ..      | ... | 1 |                   |                                    |
|                             | Uganda ...       | ... | 1 |                   |                                    |
|                             |                  |     | — | 5                 |                                    |
| India :                     | Burma ...        | ... | 1 |                   |                                    |
|                             | United Provinces |     | 2 |                   |                                    |
|                             |                  |     | — | 3                 |                                    |

|                      |     |     |   |    |      |
|----------------------|-----|-----|---|----|------|
| Dominions: Australia | ... | 2   |   |    |      |
| New Zealand          | ... | 1   |   |    |      |
|                      |     | —   | 3 |    |      |
|                      |     |     | — | 11 | 15.4 |
| PRIVATE STUDENTS     | ... | ... |   | 2  | 2.5  |
|                      |     |     |   | —  | —    |
| Totals               | ... | ... |   | 21 | 26.5 |
|                      |     |     |   | —  | —    |

6. Owing to the continued financial depression, the number of students was still considerably below normal, though it compared favourably with the number in the previous year, which was only ten. Apart from regular students, a number of forest officers and others attended the Institute for short periods to work in the library and the laboratories.

7. *Degrees and Diplomas.* There is an increasing tendency among students of the Institute to take up some special line of work with the view of qualifying for the degree of B.Sc. or the University Diploma in Forestry. During the year one student was awarded the degree of B.Sc. and three were awarded the Diploma. Their names and the special subjects on which theses were written are as follows:—

*Degree of B.Sc.*

G. S. Cansdale: 'A critical Investigation of the Black Poplars and their Hybrids, and of certain morphological Characters in the Genus *Populus*.'

*Diploma in Forestry.*

H. L. Edlin: 'A critical Revision of certain taxonomic Groups of the Malvales.'

A. O. Lawrence: 'A regional Study of the Spruce and Fir Forests of the French Jura Mountains with special Reference to the Hautes Chaînes and Second Plateau.'

L. A. Newman: 'A statistical Analysis of irregular Woods in the Spruce and Fir Forests of the Hautes Chaînes and Second Plateau of the French Jura.'

#### IV. INSTRUCTION AND RESEARCH.

##### I. SILVICULTURE AND FOREST MANAGEMENT.

8. *Staff.* The work of this section was shared between the Director and Mr. R. Bourne, while assistance in regard to British forestry was given by Mr. J. Macdonald, Forestry Commission Research Officer attached to the Institute. Questions relating to forest soils were dealt with in the Soil Science Laboratory, under Mr. C. G. T. Morison.

9. *Instruction.* The Director gave a course of lectures on tropical silviculture. Mr. Bourne lectured on silviculture and forest management, including ecological principles, the application of land utilization, regional and air surveys, methods of stock-taking and yield regulation, preparation and control of working plans, and organization of research; he also gave a course of lectures on silvicultural systems in preparation for the summer Continental tour. As a general exercise, the probationers compiled detailed reports on selected Colonies, involving a study of much of the scientific literature available and the preparation of regional maps. Mr. Macdonald gave a special course of lectures, together with tutorial instruction, on experimental methods as applied to silviculture.

10. *Practical Instruction and Tours.* Kennington Nursery continued to be used for instruction and demonstrations of experimental methods by Mr. Macdonald, who also arranged visits by four students to forest areas in Great Britain, and gave special instruction with the Forestry Commission's sample plot party to one probationer from Cyprus. Mr. Bourne supervised field work on land utilization and regional surveys, together with a soil survey in the Chilterns.

11. In the summer vacation Mr. Bourne was in charge of an instructional tour in the Vosges, Jura, Switzerland, and the Black Forest. A reconnaissance survey was undertaken in the Upper Vosges, and five distinct forest types were identified and described; in the Jura and Black Forest the types distinguished in previous years were further studied and compared. This work afforded further proof of the close relationship existing between type and timber production, both as to quantity and to quality, and demonstrated the need for a classification of forest types with a view to placing forest practice, in the matter of production and utilization, on a sound ecological basis. The comparisons made of the forest types in the Vosges, Jura, and Black Forest also illustrated the significance of a regional classification of vegetation. As already mentioned, two students, Mr. Lawrence and Mr. Newman, both from Australia, were awarded the Diploma in Forestry for work done in the collection and classification of data in the Jura. Special arrangements were made for three probationers to visit selection forests in the Bernese Oberland and for one officer on leave from India to tour in Germany, Sweden and Norway. In addition to the above tours, three students were attached for a short time to the School of Forestry tour in Normandy, under Mr. Lloyd. The Institute is again much indebted to the various forest officers whose charges were visited in the course of these tours.

12. *Research.* Special research on problems of physiology and soils in relation to forestry remained in abeyance for lack of funds. Mr. Bourne continued his regional survey of the area between the Chilterns and the New Forest, in the course of which he has already identified and delimited several examples of twelve distinct unit regions on a strip roughly 1,000 square miles in extent. In regard to this work he reports as follows: 'Although some of these unit regions are clearly defined by differences in topography or geology, the boundaries of others were determined only by means of detailed soil and vegetation surveys. Each unit region, however many isolated examples of it may occur, comprises in fact a distinct series of soils, and the survey has so far demonstrated no single fact more clearly than the close correlation of agricultural practice and woodland vegetation with soil. In the matter of agriculture, hundreds of anomalies exist which are attributable either to historical factors, the preferences of individual owners, or the immediate proximity of a market town, but they fail to obscure the fact and, indeed, generally prove beyond question that there is a limit to the possibilities of enhancing the natural fertility of soils by manure or scientific cropping methods. It is a recognized truth that some regions are more productive than others; nevertheless neighbouring farmers in a major region, working in what at first sight might appear to be similar country, such as the Hampshire chalk uplands, though equally well situated in relation to the markets, are often scientifically very differently placed in that they have to deal with a distinct series of soils. In the matter of woodland vegetation, in spite of the varied nature of the principal tree species and silvicultural practice, following upon differential human intervention in the past, local detailed investigations have shown that the differences in soils and the several stages reached in their development are always reflected in the vegetation, and to such an extent that the natural climax vegetation on each distinct soil type should be classified as a separate forest type. In practice it has been demonstrated that the advice to be tendered to woodland owners should be influenced not only by the proximity to markets and the condition of the forest but also by the soil type. The general conclusion reached is that the greatest need in the area in question is for a detailed soil survey, and there is no doubt that this applies to many other areas. At the same time, it is evident that a preliminary regional survey, such as that undertaken, would greatly facilitate the organization and execution of the soil survey.'

13. *Advisory Work.* The amount of advisory work relating to questions of silviculture and forest management continues to increase, and enquiries have been received not only from different

parts of the British Empire but also from foreign countries. In Great Britain several inspections of woodlands have been undertaken by Mr. Bourne. In the Colonies there is a growing tendency on the part of forest officers to consult the Institute on the solution of their technical problems, and in this connection copies of enumeration statements and stock-maps would be welcomed not only for examination but also for instructional purposes.

## 2. SYSTEMATIC FOREST BOTANY.

14. *Staff and Instruction.* Dr. Burt Davy continued in charge of this section, with Mr. A. C. Hoyle as Assistant. Twelve students attended regular courses of instruction, of whom eight were probationers (Nigeria 1, Gold Coast 2, Sierra Leone 1, Cyprus 1, unallotted 3), two were forest officers on leave (representing Nyasaland and Burma), and two were private students.

15. *Botanical Identifications.* The total number of botanical identifications completed during the year was 4,416 as compared with 4,674 for the previous year. There has been an increase of about 500 determinations for the African territories, the total number of which was 3,181; the material came from the Gold Coast, Kenya, Nigeria, Nyasaland, N. Rhodesia, S. Rhodesia, Sierra Leone, Tanganyika Territory, Uganda, the Union of South Africa, and Zanzibar. Other Colonies for which identifications were made included British Guiana, British Honduras, Cyprus, and the Solomon Islands. In the course of this work a new genus and about twenty new species of trees and shrubs from tropical Africa have been brought to light; these are being described for publication. The number of poplars and willows sent for identification fell to the normal, after the abnormally heavy influx in 1932-33, which was due to the special investigation of these two groups being carried out during that year; this accounts for the slight reduction in the total number of identifications made. Specimens identified for the Forest Products Research Laboratory numbered 362. Those identified for other correspondents, and for officers of other sections of the Institute in connection with their work, numbered 662. A classified list of botanical identifications is given in Appendix II.

16. *Work of Research Students.* Work carried out under the supervision of Dr. Burt Davy included an investigation of the black Italian poplars and their hybrids, by Mr. G. S. Cansdale, a probationer, who was awarded the B.Sc. degree on a thesis prepared as a result of this work. A comparative study of the genera of the Malvales was carried out by Mr. H. L. Edlin, a private student, with a view to a correlation of the taxonomy and wood anatomy in this order. Mr. Edlin was awarded the Diploma in Forestry on a thesis prepared on this subject. Work

on the systematy of the cultivated species of *Eucalyptus* has been carried out by Mr. R. A. de Rosayro, a student of the School of Forestry, who put in extra time in the herbarium.

17. *Forest Trees and Timbers*. In collaboration with the Section of Wood Structure, some progress has been made with the series of 'Forest Trees and Timbers of the British Empire.' No. II, dealing with twenty West African species, has been issued, and Nos. III ('Fifteen British Central American Timber Trees') and IV ('Fifteen South African Timber Trees') are under preparation.

18. *Check Lists*. Good progress has been made in the compilation of check lists as a preliminary to the preparation of local forest floras and descriptive catalogues of trees and other plants of importance to forestry in the Colonies. Since the preparation of these lists was begun, a large amount of useful work has been done by the several forest departments, in co-operation with the Institute, in elucidating the composition and resources of their forests. A large amount of field work remains to be done, however, before the forest resources of most of the Colonies can be assessed with any degree of accuracy. In some Colonies and Protectorates there persists an impression that no work can be done in collecting botanical material until the Forest Department is strong enough to second an officer solely for that purpose. Experience has shown that this view is erroneous, and that small contributions of specimens, collected systematically over a period of years, will soon place a department in a position to undertake an estimate of its forest resources.

19. The following table summarizes the present position in regard to the preparation of check lists :—

#### WEST TROPICAL AFRICA.

|                    | 1934 List. |      |      | First List. |      |      | Increase. |      |      |
|--------------------|------------|------|------|-------------|------|------|-----------|------|------|
|                    | Fam.       | Gen. | Spp. | Fam.        | Gen. | Spp. | Fam.      | Gen. | Spp. |
| Nigeria            |            |      |      |             |      |      |           |      |      |
| (First List, 1914) | 82         | 461  | 1240 | 35          | 132  | 201  | 47        | 329  | 1039 |
| Gold Coast         |            |      |      |             |      |      |           |      |      |
| (First List, 1913) | 84         | 490  | 1152 | 57          | 215  | 327  | 27        | 275  | 825  |
| Sierra Leone       |            |      |      |             |      |      |           |      |      |
| (First List, 1933) | 68         | 318  | 528  | 66          | 314  | 510  | 2         | 4    | 18   |
| Gambia Colony      |            |      |      |             |      |      |           |      |      |
| (First List, 1920) | —          | —    | —    | 3           | 4    | 4    | —         | —    | —    |

#### EAST TROPICAL AFRICA.

|                    |     |     |      |       |     |     |    |     |      |
|--------------------|-----|-----|------|-------|-----|-----|----|-----|------|
| Uganda             |     |     |      |       |     |     |    |     |      |
| (First List, 1905) | 110 | 377 | 1371 | 45    | 87  | 113 | 65 | 290 | 1258 |
| Kenya              |     |     |      |       |     |     |    |     |      |
| (First List, 1926) | 115 | 449 | 918  | 97    | 271 | 381 | 18 | 178 | 355  |
| Tanganyika         | ... | 105 | 539  | 2040* | —   | —   | —  | —   | 3/   |

\* This list requires revision : it is probable that it contains too many shrubby species, woody herbs, and synonyms.

## SOUTH-CENTRAL TROPICAL AFRICA.

|                                   | 1934 List. |      |      | First List. |      |      | Increase. |      |      |
|-----------------------------------|------------|------|------|-------------|------|------|-----------|------|------|
|                                   | Fam.       | Gen. | Spp. | Fam.        | Gen. | Spp. | Fam.      | Gen. | Spp. |
| N. Rhodesia<br>(First List, 1932) | 92         | 355  | 972  | 81          | 297  | 735  | 11        | 58   | 237  |
| S. Rhodesia<br>(First List, 1932) | 91         | 328  | 883  | 86          | 296  | 800  | 5         | 32   | 83   |
| Nyasaland<br>(First List, 1930)   | 110        | 453  | 1307 | 93          | 315  | 803  | 17        | 138  | 504  |

## THE SOUTH-TEMPERATE REGION.

|                                          |    |     |     |   |   |   |   |   |   |
|------------------------------------------|----|-----|-----|---|---|---|---|---|---|
| Union of S. Africa<br>(First List, 1921) | 73 | 211 | 455 | — | — | — | — | — | — |
|------------------------------------------|----|-----|-----|---|---|---|---|---|---|

## OTHER TERRITORIES.

|                                                                                 |    |     |     |    |     |     |   |    |     |
|---------------------------------------------------------------------------------|----|-----|-----|----|-----|-----|---|----|-----|
| Cyprus (and Malta,<br>Gibraltar, Pales-<br>tine and Aden)<br>(First List, 1932) | 81 | 203 | 563 | 81 | 179 | 460 | — | 24 | 103 |
| Solomon Islands ...                                                             | 62 | 150 | 231 | —  | —   | —   | — | —  | —   |
| Trinidad ...                                                                    | 64 | 227 | 363 | —  | —   | —   | — | —  | —   |

20. The following points emerge from an examination of the check lists in detail :—

*Gambia Colony.* From the forest point of view this is a *terra incognita*, since no list of trees has ever been published. *Khaya senegalensis* is said to be common along the Gambia River. In the early part of last century a considerable quantity of 'mahogany' is reported to have been obtained from this species and shipped to England. Two timbers called 'rosewood' are said to occur, but in what quantities is unknown, nor is it known what kinds of rosewood are referred to, though it has been suggested that one of them is a *Pterocarpus* and the other a *Dalbergia*. The favourable situation of the Gambia Colony suggests the desirability of studying its possibilities as a centre for forestry.

21. *Sierra Leone.* The meagre character of the list of species recorded suggests that it might be increased by probably 100 per cent. if a botanical reconnaissance of the forest resources of the Colony and Protectorate were undertaken.

22. *Gold Coast.* The work of collecting was encouraged by the late Conservator of Forests, Mr. King Church, and useful pioneer work was done by the late Dr. T. F. Chipp. This has been followed with excellent results by Mr. Chidlow Vigne, A.C.F., who has added a new genus, *Chidlowia* Hoyle, and a considerable number of new species, to the list of woody plants. Twelve new species have recently been published, and others await description. The number of species and varieties recorded is now 1,152, comprised in 84 families and 490 genera. With two families and about 30 genera more, and 88 species fewer, than are recorded

for Nigeria, it is probable that the number of species should be considerably higher. The increase over the first check list is approximately 350 per cent. Collecting has been done chiefly in a few limited areas. There is need for a botanical survey of the forest areas in districts as yet untouched; this applies particularly to the west side of the country, marching with the Ivory Coast, a region rich in tree species. A botanical reconnaissance is urgently needed, and until this has been made it will not be possible to estimate its potential forest resources. An experienced forest botanist with a knowledge of the country could accomplish much in a year.

23. *Nigeria*. A first check list, published in 1914, included only 201 species and varieties, belonging to 132 genera and 35 families. Good work has been done in the last few years by officers of the Forest Department, and especially by Mr. J. D. Kennedy, in collecting botanical material. Our revised MS. list enumerates 82 families, 461 genera and 1,240 named species and varieties; this represents an increase of over 500 per cent. over the 1914 list, and an increase of 360 species, or 41 per cent., in the two years 1932-34. Nine new species have been discovered in the last three years and described at the Imperial Forestry Institute. Much more work remains to be done in areas not yet touched; the Oban and Cameroon districts, for instance, are rich in tree species, though little is known about them. The trees of the Bauchi Plateau are also little known, and elsewhere there are extensive areas not yet explored botanically. It would probably repay the Government to second an experienced Assistant Conservator for a botanical reconnaissance of the whole of Nigeria.

24. *Uganda*. During the last two years good progress in the collection and identification of the forest trees and shrubs has been made by the Forest Department, which has co-operated zealously with the Institute in the compilation of a check list, which now includes 1,371 species, belonging to 377 genera and 110 families. Certain important timber-producing genera of Meliaceae, Caesalpiniaceae, etc., are still in a state of confusion, and much more botanical material is required in order to settle outstanding points. The Uganda tropical rain-forest species show a definite relationship with species of West Tropical Africa. Among the mahoganies, some of the Uganda forms appear to intergrade between forms looked upon as distinct species in West Africa, thus throwing doubt on the specific status of some of the latter; in order to clear up the matter, botanical material showing the range of variation within the species, and on individual trees, is required. In order to carry this out effectively it is desirable that an officer trained in systematic botany should be seconded for the work.

25. *Kenya Colony*. Mr. Battiscombe's list, published in 1926, comprised 383 species, in 271 genera and 97 families, but several of the trees and shrubs recorded were not specifically identified. The 1934 check list included 918 species, in 115 families and 449 genera, an increase of nearly 150 per cent. The number of recorded species is about 450 less than in the Protectorate of Uganda. As Kenya has an extremely varied topography and climate, ranging from tropical sea-coast to high snow-clad mountains, and as even more vegetation types occur in Kenya than in Uganda, the number of species is likely to be at least as great as, if not greater than, that of Uganda. This is further indicated by the fact that already Kenya has five more families and 72 more genera recorded than Uganda, which suggests that the number of species per genus is probably higher than has been recorded so far. One new genus and six new species have been described at the Institute in the last three years.

26. *Tanganyika Territory*. The enumeration of the Tanganyika trees and shrubs is in progress, but is not yet completed. Altogether 105 families, 539 genera, and 2,040 species are recorded, but the list needs revision as it obviously includes low shrubby species and synonyms; ninety-three woody parasites of the genera *Loranthus* and *Viscum* are included. The preparation of this check list has involved a protracted search through the publications of the late Dr. Engler of Berlin, one result of which has been the discovery that over fifty names of trees and shrubs printed in his *Vegetation der Erde, Band IX*, and his *Pflanzenwelt Ost-Afrikas, Band C*, are without descriptions and, therefore, must be treated as *nomina nuda*, i.e. names which cannot be identified. As an illustration of the amount of botanical work remaining to be done in Tanganyika Territory, the field work of Mr. B. D. Burt, of the Tsetse Research Department, has resulted in the discovery of a new genus of trees, named *Burtia* by the British Museum, and some twenty-five new species of plants which bear the name *Burtii*; these were discovered over a relatively limited area of the Territory, which suggests that much more remains to be discovered in the lesser-known areas, including the tropical rain-forest on the west side of Lake Victoria, the temperate rain-forest of the peaks north of Lake Nyasa, and the deciduous forest and woodland extending along practically the whole of the southern border of the Territory. Mr. Burt's material was named by the British Museum and Kew; it is referred to here as indicating how much can be done by one man in a limited area in a very short time, in addition to his routine duties. It is clear that a botanical reconnaissance of Tanganyika Territory is required. Much could be done in this direction by Assistant Conservators of Forests in territorial charges. Among interesting recent discoveries may be men-

tioned a new species of *Entandrophragma* (*E. lucens* Hoyle), described in 1932.

27. *Nyasaland*. The number of woody species and varieties recorded is 1,307, comprised in 110 families and 453 genera. This is an increase over the 1930 check list of 504 species, 138 genera and 17 families. The remarkable increase of about 39 per cent. of species and varieties is due largely to the enthusiasm and energy of the Conservator, Mr. J. B. Clements, and the efforts of his three Assistant Conservators of Forests. Further investigation is required on the forest flora of the northern part of the Protectorate, that is, north of Kota Kota. The forest flora of Mt. Mlanje and other high peaks requires further study, while a promising field for a reconnaissance is the range of mountains lying west of Port Herald.

28. *Northern Rhodesia*. Dr. Burtt Davy visited the Colony and collected material first in 1905, and again in 1919. Mr. R. Bourne collected specimens and reported on the forests in 1927. In 1929 Dr. Burtt Davy again visited the Colony and made further collections during a tour of three weeks in company with Mr. Stevenson, the newly-appointed Forest Officer in charge. A check list was prepared in 1932, enumerating 735 species, belonging to 297 genera and 81 families. The three Assistant Conservators appointed since 1929 have been very industrious in collecting material, which has been identified at the Institute. This material has brought the list up to 972 species, belonging to 355 genera and 92 families, an increase of 237 species, 58 genera, and 11 families. This number of species is 335 fewer than that recorded from the adjacent Protectorate of Nyasaland. The difference may well be due to the topography of Northern Rhodesia, which is that of a vast plateau, with very little diversity in altitude, whereas Nyasaland has a considerable range of altitude, from about 100 ft. to some 10,000 ft. above sea-level. A region having a very diversified topography usually carries more species, other things being equal, than one with a fairly uniform topography. Nyasaland has much rain-forest, while N. Rhodesia has none. Eleven new species of trees and shrubs have been discovered since 1928, and described at the Institute.

29. *Southern Rhodesia*. The S. Rhodesia records show about 100 species fewer than have been noted for N. Rhodesia. This indicates that in spite of the several collections (Eyles, Gibbs, Steedman, Swynnerton, etc.) made in S. Rhodesia, there is a great deal of work still to be done before an approximately correct estimate of the woody flora can be formed. The temperate rain-forest of the escarpment should have increased the number of species considerably, as compared with that of N. Rhodesia.

30. *Cricket-bat Willow Investigations.* The preparation of a bulletin on behalf of the Forestry Commission has been carried on jointly by Dr. Burt Davy and Mr. Day. Advice has been sought by growers as to the botanical identity of the species and hybrids being grown, and the methods of propagation and after-treatment to be adopted, which has involved visits to different bat-producing areas; these visits have proved very useful as a means of collecting further data. It has been found that growers with experience extending over many years are still growing *Salix fragilis* and the *Salix fragilis*  $\times$  *S. alba* hybrids, mixed with true *S. alba* var. *caerulea*; and in one case several well-grown trees of *S. viminalis* were found in a stand of *caerulea*, on an estate growing over a thousand bat-willow trees.

31. These visits to growers have emphasized the fact that only a small number of those who grow bat-willows take any trouble about them after they are once planted. Injury from live-stock and other causes, and lack of attention, too often result in serious defects in the stems and in crooked growth. When it is remembered that only the three lowest 'rounds' (up to 7 ft.) of a bat-willow are suitable for making good quality bats, and that such injuries may result in the wholesale rejection of 'clefts,' the scarcity of first-class bat timber, in spite of the thousands of trees grown, can be understood.

32. The seedling bat-willows being propagated at Long Ashton in connection with this investigation are making excellent growth in spite of the very unfavourable season. The hybrids have not shown uniformity of growth, some being much more vigorous than others; there are definite indications that the difference is heritable. The question of the possible identification of hybrids as distinct from true *Salix alba* var. *caerulea* has been under consideration. It was realized that if the chromosome numbers in the hybrids differed from those of the two parents (*S. alba* L. and *S. fragilis* L.), it would be possible to detect a hybrid 'sett' or young tree obtained by mistake for the true *caerulea*. Dr. Kathleen Blackburn, of the Armstrong College, Newcastle-upon-Tyne, kindly undertook to look into the matter from the cytological point of view. The willows in question will root in water at practically any time of the year, which facilitates the production of material for a study of chromosome numbers in the root-tips. All of the *S. alba* varieties and hybrids examined were found to have seventy-six chromosomes; these are extremely small, making it difficult to count them. Typical *S. alba* var. *caerulea* shows only two chromosomes with satellites, while *S. fragilis* and the hybrids (*S. alba*  $\times$  *fragilis*) show at least four chromosomes with satellites. It may be definitely stated, therefore, that there are indications of the possibility of

separating immature *Salix alba* var. *caerulea* from closely-related sorts. This work was carried out by Mr. J. Wilkinson under the direction of Dr. Blackburn, on material selected and supplied by Dr. Burt Davy. A preliminary account has been published by Mr. Wilkinson in *Forestry*, Vol. VIII, No. 1 (June, 1934). An investigation of the number of stomata and of surface pubescence of willow leaves has been made by Dr. Bancroft in connection with the cricket-bat willow problem. These characters prove to be unreliable unless used with great discretion, as shown in notes published in *Nature* and the *Journal of Botany*.

33. *Elm Investigations*. In connection with the identification of native trees for the Forest Products Research Laboratory, Dr. Burt Davy has given considerable attention, during the last few years, to the collection and study of the British elms. The number of forms found growing wild in Britain exceeds a dozen. Of these, however, only five appear to be worthy of specific rank, the remainder being arboricultural varieties, or mutations or putative hybrids. The good species are: *Ulmus montana* Stokes, *U. nitens* Moench, *U. campestris* L., *U. minor* Miller, and *U. stricta* Lindl. Two of the most common hybrids are the Dutch elm,  $\times$  *U. hollandica* (Miller) Moss, and the Huntingdon elm,  $\times$  *U. vegeta* (Loud.) Moss; these are putative segregates of the hybrid *U. montana* Stokes  $\times$  *U. nitens* Moench. Many other puzzling segregates occur which require investigation, for some of the hybrids appear to be more rapid and vigorous in growth than the common elm, *Ulmus campestris* L., and to furnish timber superior to that produced by it.

34. This investigation is now being continued by Dr. Bancroft, who has prepared a series of six short articles which have been accepted for publication in the *Gardeners' Chronicle*. In these she has summarized concisely the conflicting opinions to be found in the writings of Henry, Bean, Moss, Druce, Hooker, Babington and other writers, and has expressed her own and Dr. Burt Davy's views on the limits of the principal species and hybrids. The balance of evidence appears to favour the view that the common English elm is a good species, representing a specialized insular (British) form of a Continental species. The indications are, however, that the genus *Ulmus* is in an exceedingly plastic and variable condition, and great caution should therefore be used in applying specific names. The problem of the status of the intermediate forms and putative hybrids of the British elms can be solved only by genetical work; here, again, Dr. Blackburn of the Armstrong College is assisting by carrying out an investigation to determine whether chromosome numbers in the cells of the root-tips will throw any light on the question.

35. *Systematy of Monotoideae*. Working in the Wood Structure laboratory, Miss J. Dickson has made a detailed examination of the leaf-characters of Monotoid species, with a view to constructing a key for identification purposes. The two most constant and reliable features appear to be the number of pairs of lateral veins and the length of the petiole, other characters, such as shape, size and surface pubescence of the leaves being extremely variable. Miss Dickson is at present investigating the floral anatomy of the Monotoideae and related forms, of which material has been kindly sent by Messrs. H. E. Desch and C. F. Symington (Federated Malay States); her collected work on these types is to be presented in due course as a thesis for the degree of D.Phil.

36. *Nomenclature*. The elm investigation has demonstrated the present unsatisfactory state of botanical nomenclature, especially as it affects the names of many of the better-known species of trees. In an endeavour to effect some sort of finality and avoid the frequent changes of name which have occurred in the past and are still taking place, the matter has been referred to the four chief forestry societies of Great Britain with the proposal that a list of *nomina specifica conservanda* be adopted. This proposal has been accepted by three of the societies, and the Imperial Forestry Institute has been asked to represent the matter in the proper quarter, with a view to its being brought up at the International Botanical Congress to be held in Amsterdam in 1935. A decision is still awaited from the other forestry society.

37. *University Park*. The completion of the work of naming the trees in the University Park has been delayed owing to difficulty with the elms, of which there is an unusually mixed lot of varieties, hybrids or mutations. Dr. Bancroft has undertaken to name these in continuation of the work on the genus which she has been doing. Altogether thirty-six additional trees have been named and labels have been supplied.

38. *Experiment in hybridizing Larch*. An attempt has been made, in a larch plantation on Shotover, to hybridize *Larix decidua* Mill. with pollen of *L. leptolepis* Murr., in order to produce a true hybrid which might throw further light on the origin of the Dunkeld larch, and which might prove to be worth propagation. Out of twelve young cones pollinated in the end of March, four developed and matured, from the seed of which it is hoped to obtain seedlings.

39. *Reference Herbarium*. The number of specimens received for the reference herbarium was 4,991, and the total number of

mounted sheets is now 47,994. A classified list of herbarium accessions is given in Appendix III and a statement of exchanges is contained in Appendix IV.

40. *Acknowledgments.* The Institute is again much indebted to the Director and staff of the Royal Botanic Gardens, Kew, and to the Keeper of Botany and staff of the British Museum (Natural History) for facilities for consulting the collections under their charge, for the loan of authentic material for study, for information on questions of nomenclature, and for the identification of herbaceous plants sometimes included by forest officers in their collections. The Director of Kew has continued to publish the descriptions of new species, and other papers, in the *Kew Bulletin*. Acknowledgments are again due to Prof. Dr. W. Robyns, Director of the *Jardin Botanique de l'État*, Brussels, for the loan of type specimens, to Messrs. Albert Wilson, F.L.S., and H. N. Dixon, F.L.S., for assistance in the determination of British and Colonial mosses, and to the Sherardian Professor of Botany and the Linnean Society, London, for the loan of books.

### 3. STRUCTURE AND PROPERTIES OF WOOD.

41. *Staff and Instruction.* Dr. L. Chalk continued in charge of this section, with Miss M. M. Chattaway and Mr. C. L. Stocker as Assistants. For financial reasons the appointment of the latter had to be terminated in April. Thirteen students underwent courses of instruction, of whom eight were probationers, representing Cyprus, Gold Coast (2), Nigeria, Sierra Leone, and unattached (3); four were forest officers, representing Australia (2), British Honduras, and Uganda; and one was a private student. In addition, a forest officer from Kenya spent some time working on material in the collection under the supervision of Dr. Chalk.

42. *Research.* Miss Chattaway continued her research on the Sterculiaceae and published two papers on the structure and development of the rays. Dr. Chalk and Miss Chattaway have been investigating the length of vessel elements and its significance, with a view to recommending a standard method of measurement for descriptive purposes. At present the different systems which are in current use do not give comparable results, and some measure of standardization is urgently required. Mr. C. L. Stocker continued his work on the Leguminosae, and completed a macroscopic key to the woods represented in the Institute collection, and also generic descriptions of two of the sub-families. Dr. Chalk carried out a further investigation of the effect of transplanting on the ring width of seedlings, and published a paper on this subject.

43. Dr. Bancroft and Miss J. Dickson have continued their research on the systematic anatomy of dicotyledons. Owing to the kind co-operation of various Colonial officers, it has been possible to examine systematically a considerable collection of species of *Monotes* and *Marquesia* (Dipterocarpaceae). Two papers, 'The Wood-anatomy of representative Members of the Monotoideae' and 'New Material of *Monotes Kerstingii* Gilg,' have been completed by Dr. Bancroft and accepted for publication by *The American Journal of Botany* and *The Kew Bulletin* respectively. The investigations show that so far as wood-anatomy is concerned, the Monotoideae are a very coherent and somewhat circumscribed group, with a much closer affinity to the Dipterocarpaceae than to any other family; the structure and properties of the timbers indicate that they are of little value economically. Further material of Monotoid timbers has now come to hand, and will be investigated in due course. Dr. Bancroft has also continued her investigations of Tertiary dicotyledonous woods from East Africa and Greenland (material sent by the British Museum and the Stockholm Museum). The Greenland woods are especially interesting as having affinities with existing North Temperate genera, such as *Ulmus*, *Fagus*, *Platanus*, *Fraxinus*, *Betula*, *Morus* and *Liquidambar*.

44. *Identifications and Descriptions.* The number of identifications carried out in answer to enquiries continues to increase, and covers a wide range of material. Among interesting items was the examination by Dr. Bancroft of material of roots from a Palaeolithic settlement at Greenhithe, sent by the British Museum: these roots proved to be in all probability those of a species of elm. Descriptive work in collaboration with the Section of Systematic Botany was continued. The progress made with 'Forest Trees and Timbers of the British Empire' has been reported in paragraph 17.

45. *Wood Collection.* Over 1,500 specimens were added to the wood collection, including a particularly fine set of authentic specimens from the Forest Research Institute of the Federated Malay States. A list of accessions is given in Appendix III. During the year 650 further specimens were sectioned and added to the permanent slide collections, the majority of these being species not previously represented. In addition, over a thousand slides have been received in exchange, chiefly from the Federated Malay States and the Forest Products Research Laboratory, Princes Risborough. The work of indexing the anatomical characters of these woods has been continued. Nearly 800 slides, and the usual number of photomicrographs and specimens, have been distributed.

## 4. FOREST PATHOLOGY.

46. *Staff and Instruction.* Mr. W. R. Day continued in charge of this Section, with Mr. T. R. Peace as Assistant engaged on research work for the Forestry Commission. One private student attended a course of instruction.

47. *Frost Damage.* A memoir dealing with the critical temperatures for, and the diagnosis of, frost damage was published during the year. Work on the influence of accessory factors on the amount of injury caused by frost has continued. A final assessment of the work done up to the present has yet to be made, and until that is done little can be said of the results obtained. The whole of this portion of the work will come under review early in the following year. Some preliminary experiments were done with poplars, in connection with the work being carried out on poplar canker. These are critical point experiments, and the results have yet to be fully determined. Some preliminary experiments were also done on bat willow to see if anything similar to the early stages of stain could be obtained by freezing.

48. *Dasyscypha calycina* and *Phomopsis pseudotsugae*. So far little other than negative results have been obtained with the inoculations carried out with these fungi. This supports the contention that the cause of the canker on larch and the die-back on Douglas fir is, at least for the most part, frost. An endeavour has been made to prepare plants for infection by freezing, thus imitating the manner in which the plant is prepared for the fungus in nature. It has been possible to prepare a certain number of plants in this way.

49. *Elm Disease.* The sixth annual survey of the Forestry Commission showed no appreciable increase of the disease caused by *Ceratostomella* (*Graphium*) *ulmi*, the Dutch elm disease. In view of the exceptionally dry seasons of 1933 and 1934, the survey is of considerable interest, and may, it is hoped, help to throw some light on the influence of such seasons on the progress of the disease. To do this satisfactorily it will be necessary for the survey to be maintained for several years longer. There is, in fact, every reason for the continuance of this work for a period of ten years, at the end of which time it could come up for a further review and report. It may be pointed out that this is the only comprehensive attempt that has been made, so far, to watch the progress of the disease, and thus attempt to determine how seriously it has to be taken. Part of Scotland was surveyed in connection with this disease. Although no sign of the Dutch elm disease was found, the elms were in general in

a very unhealthy state. Several fungi have been isolated from diseased elms from Scotland, and inoculation experiments are now in progress to discover if they are pathogens. Thanks are due to the authorities of Eton College for facilities given to observe a pruning and fertilizing experiment, which is being carried out on certain diseased elms there. So far this experiment has not yielded any conclusive results.

50. *Phytophthora Disease of Beech and Chestnut*. The work during the past twelve months has shown that the root disease of beech and sweet chestnut, which in the case of the latter is known as the ink disease, is spread throughout the south of England. The disease continues to be most virulent on the sweet chestnut, and where it has appeared threatens to make its successful cultivation impossible. On chestnut the disease has been observed in Buckinghamshire, Herefordshire, Hampshire, Somersetshire, and N. Devon; on beech in all these counties except Herefordshire. Inspections made last year showed that the disease was still progressing where it had been first observed. The species of *Phytophthora* now isolated are *P. cambivora* (Petri) Buis., *P. cinnamomi* Rand, and *P. syringae* Klebahn. The first two have been isolated from chestnut and the first and last from beech. *P. syringae* is, however, able to attack chestnut, as is shown by inoculation experiments. Special thanks are due to the Imperial Mycological Institute, and especially to Mr. S. F. Ashby, B.Sc., for having identified these species from the cultures prepared. In the case both of beech and of chestnut there seems to be a relationship between liability to infection and the nature of the soil. Up to the present the heavier, more retentive and wetter soils have been those on which the disease has been observed. Further observation is needed on this point, but the question is made difficult from the fact that it is not easy to collect material satisfactorily from large trees without uprooting them.

51. *Meria laricis*. Work on the leaf-cast disease of larch is now confined to routine sprayings in various nurseries. Favourable reports have been received on the effect of spraying, and a satisfactory programme for this seems to have been established.

52. *Poplar Canker*. This disease, or group of diseases as the case may eventually prove to be, has been observed in places scattered throughout England and a considerable part of Scotland. There is no doubt that it is one of the most widespread tree diseases in the country. The susceptibility and resistance of the species under observation has been maintained, and it would appear that one is here dealing with a constitutional character, and not with a variation caused by differing conditions in the environment. Much more has yet to be learned about this. An

attempt is being made to isolate a possible parasite from the canker occurring on *P. eugenii*, but so far without any satisfactory result. As has been mentioned above, certain refrigerator experiments have been carried out in connection with this.

53. *Damping off of Seedlings.* As a result of the work done in the previous year, certain substances were chosen as being of promise as fungicides in the control of this disease. These have been further tested during the year. The work is not yet finished, and the final assessment will not be done till later in 1934. The value of pretreatment of the soil, before sowing the seed, has been demonstrated. Treatment while the seed is germinating has produced rather contradictory results, and certain substances, such as permanganate of potash, have been very disappointing. It will be necessary to continue this work for some time yet.

54. *Needle Cast of Pines.* Plants have been kept under observation in connection with this, both in the garden and in the laboratory; there is as yet nothing special to report on this matter.

55. *Leaf Rust of Birch (Melampsoridium betulinum).* The endeavour to find out how this rust overwinters has so far failed. It is still being kept under observation, and in Kennington Nursery has been kept down with the aid of sulphur sprays.

56. *Butt Rot of Conifers.* Material for this continues to come in. The chief fungus obtained so far is *Fomes annosus*, but certain others have also occurred. *Stereum sanguinolentum* was isolated from a tree in Bagley Wood; this is of particular interest, as in some parts of North America it causes a considerable amount of loss. So far as is known, this is the first record in this country of the fungus in question causing heart rot. The identification was made by Mr. K. St. G. Cartwright, of the Forest Products Research Laboratory.

57. *Advisory Work.* Eighty enquiries were dealt with during the year. Some were of minor importance, but many entailed a considerable amount of work, with personal visits in certain cases.

## 5. FOREST ZOOLOGY.

58. *Staff and Instruction.* Dr. R. N. Chrystal continued in charge of this Section, with Mr. J. M. B. Brown as Assistant Entomologist engaged on research work on behalf of the Forestry Commission. No students attended courses of instruction.

59. *The Pine-shoot Tortrix Moth (Ryacionia buoliana Schiff).* The survey of the distribution of this insect in East Anglia has now been completed, and sample strips for the study of the damage inflicted have been laid out at Rendlesham and Tunstall.

Comparisons made between these and the plots recently established at Wangford and Swaffham showed that the more recently surveyed areas, especially those at Tunstall, were considerably more heavily attacked. Experiments in the mitigation of the damage by silvicultural means are now to be undertaken, and with these in view some further information on the proportion and distribution of the damaged trees will be required. The results of this work have now been written up and added as a second part to C. C. Brooks' paper on the biology of the insect. This includes also a full description of the results of the control experiments which were fully tried out on the lines originally proposed by him.

60. *The Green Oak Tortrix Moth (Tortrix viridana L.)*. Serious defoliation of the oaks in the Forest of Dean and other localities (Cheshire, Berkshire, Surrey) was again recorded, though the immunity of the New Forest emphasised the discontinuity of the outbreak. In the Dean Forest *T. viridana* was again the chief species concerned, although local outbreaks of the mottled umber moth (*Hybernia defoliaria*) also occurred. A feature of this year's attack was the considerable population of caterpillars found in the High Meadow. In the Dean Forest the amount of defoliation in one or two of the worst areas was perhaps slightly less severe than in 1933. Parasites are now being bred from several woods, and the results justify the inference that these enemies of the caterpillars, even in localities unfavourable to their increase, may deal ultimately with an outbreak, when this is not previously terminated by some other factor. Although there is still much to be found out about this insect, sufficient material has already been collected, which will be embodied in a comprehensive report. The experiments on motor dusting of oak areas against the oak tortrix, which had been proposed by Messrs. Craven of Evesham, were carried out in the Forest of Dean in May, 1934. The machine used was the latest type of 'Tornado' power duster, and trials were made with an inert powder in the first instance, to test the carrying power of the dust in the oak areas. Tests were also made with poison dusts on selected trees, to test the toxicity of these to the caterpillars. A report giving an outline of the results obtained was submitted to the Forestry Commission.

61. *Chafer Beetles*. During the summer months visits have been made to the most important forest nurseries in the South and Midlands, where serious damage by chafer beetle larvae has been reported. At present the garden chafer (*Phyllopertha*) and the cockchafer (*Melolontha*) appear to be the dominant species. *Phyllopertha* caused very heavy losses at Delamere Nursery during August and September, 1933. It has been possible ten-

tatively to assign a cause for its abundance there, and a simple means of preventing damage to seed-beds is being tried out. In the Dean Forest, during the latter half of May the greatest cockchafer swarm for many years was recorded. On the other hand, 1933 appeared to have been the flight year in the East Anglian district, and 1935 is a probable forecast for the New Forest. Later in the present season it is proposed to try paradichlorobenzene, which has been used with success against chafers in Russia and Germany.

62. *The Pine-Shoot Beetle (Myelophilus) in the New Forest.* This investigation, which was planned last year, has now been started. Some useful additions to our knowledge of this insect have already been made, and a comprehensive survey of the damage caused by it in plantations of various ages is to be started in the near future. In this work, the closest co-operation is being maintained with Mr. H. S. Hanson, of the Imperial Institute of Entomology, who has been engaged since Easter, 1933, upon an ecological study of the parasites and predators of this and other bark-beetles.

63. *Visit to Sweden, August, 1933.* Through the kindness of Professor Ivar Trägårdh, Chief of the Forest Entomological Section of the Swedish Forest Experiment Station, Dr. Chrystal made a visit to Sweden in August, 1933. The time chosen was opportune, as Professor Trägårdh and his assistants were busily engaged in the study of the bark-beetle outbreaks which have followed closely upon severe storm damage in the Provinces of Uppland and Dalarna in 1931 and 1932. Ample facilities were afforded for a study of these conditions, and visits were also paid to other forests in Dalarna. Some interesting observations were also made upon the status of *Myelophilus piniperda* as a forest pest in Sweden, which will form the basis of a comparison with the conditions as they are found to exist in this country. The Institute is much indebted to Professor Trägårdh for his kindness and help in arranging this tour.

64. *Advisory Work.* Fifty advisory enquiries were dealt with during the year. In the summer of 1933 the beech coccus was one of the most common insects sent in, and this was only to be expected in view of the dry conditions. Apart from the coccus, the most interesting inquiries brought to notice concerned the *Platypus* beetle (*Platypus cylindrus*) which was first reported from a timber yard in the West of England, and then in a timber yard in East Anglia. It appears that there has been a minor outbreak of this pin-hole borer in oak coming from certain parts of the West of England and Wales, and the extent of its occurrence caused some alarm at one time.

## 6. FOREST ECONOMICS AND POLICY.

65. Three students of the Institute attended courses of lectures on forest economics by Mr. Bourne and forest policy by the Director. Research on forest economics continued in abeyance for lack of funds, and the post of Lecturer in that subject remained unfilled. The Director dealt with a number of questions relating to forest policy and administration, particularly from the Colonies.

## 7. FOREST ENGINEERING AND UTILIZATION.

66. Mr. A. H. Lloyd continued in the charge of this Section. The usual course in road alignment and construction was given to the probationers, who also attended practical bridge construction and other field work with the R.E. Section, O.U.O.T.C. Officers on leave from Uganda and British Honduras had individual discussions on timber extraction problems, and special courses of reading were arranged on this subject. Visits were paid to the Forest Products Research Laboratory, Princes Risborough, and to timber-using industrial works in the vicinity of Oxford, including the G.W.R. Carriage Works at Swindon, for which thanks are due to the Chief Engineer, Great Western Railway. Thanks are also due to the Director, Forest Products Research Laboratory, for assistance given, and to the Oxford County Engineer for permission to visit road and bridge constructional work in the County. Instruction in Surveying was given by Colonel Tandy to one probationer for the Gold Coast.

## V. LIBRARY AND INFORMATION BRANCH.

67. *Library.* During the year 153 books and 709 pamphlets and bulletins were added to the library. A considerable number of pamphlets and bulletins from Dr. Henry's collection, mentioned in last year's report, remain to be classified and entered. Sets of periodicals numbered 124, and current periodicals 96, an increase of one over the number in the previous year. The number of books borrowed, apart from those consulted in the library, was 2,950, an increase of nearly 600 over the previous year's number; of these, 128 were borrowed by persons outside the Department of Forestry. There has been a large increase in the number of institutions with whom exchanges of publications have been arranged.

68. Acknowledgments for presentation of books and other material to the library are due to Mrs. H. W. Powell and Miss Powell; Mr. J. M. B. Brown; Dr. Burt Davy; Dr. Chrystal; Dr. Helen Bancroft; Miss Chattaway; R. C. Milward, Esq.; J. C. Willis, Esq.; Dr. R. T. Gunther; Mrs. Berkeley; Dr. E. A. Rudge; F. A. Buttress, Esq., Assistant Librarian, School of

Agriculture, Cambridge; the Editor of *Sylva*, School of Forestry, Edinburgh; the Faculty of Agriculture and Horticulture, University of Reading; the Empire Forestry Association; the Colonial Office; the Crown Agents for the Colonies; the Malayan Information Agency; M. Jagerschmidt, Paris; M. Lachausée, Arbois, Jura, France; and the Fédération Française de l'Economie Alpestre, Paris. Among these the gift of nearly a hundred works in natural history, presented in memory of the late Mr. H. W. Powell, of Oxford, should be particularly mentioned; many of these, beautifully illustrated, merit restriction to the 'privileged' section of the library. Mr. J. M. B. Brown's gift of a set of the rare *Ichneumonologia Britannica* in five volumes by C. Morely is also of unusual interest.

69. Acknowledgments are also due for assistance received from various libraries, particularly the Science Library, South Kensington; the Radcliffe Science Library; Rhodes House; the School of Rural Economy, Oxford; and the School of Agriculture, Cambridge. The co-operation of the Colonial Office and the Crown Agents for the Colonies was asked for and obtained towards the supply of handbooks of the several Colonies. Several of these have been supplied and others are promised.

70. *Information Branch.* As stated in the report of last year, the systematic referencing of current literature had to be suspended at the end of the year, for financial reasons. Temporary arrangements were made to carry on this important work on a partial basis, but it is hoped that funds may be forthcoming before long to place it on a satisfactory footing once more, since the utility of the Institute as an information centre depends largely on the referencing being kept up to date.

Mention has already been made of enquiries dealt with by different Sections of the Institute. Apart from these, there has been a heavy demand on the library and the reference files from enquirers from many parts of the world, entailing much correspondence and preparation of notes. In addition, eighty-five persons not connected with the Institute visited this branch for varying periods of time to study on their own account; in certain cases these visits involved the preparation by the Librarian of bibliographies on the subjects of study.

71. *African Research Survey.* Perhaps the most important piece of work undertaken by the information branch during the year was the preparation of a comprehensive preliminary report on questions of forestry for the assistance of the forthcoming African Research Survey.

72. *Photographic Collection.* Little progress in the work of entering and classifying the photographic collection has been possible during the year, owing to the short-handed condition of

the staff. Meanwhile the collection continues to increase. Among gifts of photographs received during the year, the most important was a set of forty-nine prints from the Forest Department of the Punjab.

73. *Exhibitions.* The Institute arranged an exhibit representative of the various sections of its work at the Bath and West Show held in Oxford in the summer of 1934. The exhibit, the general arrangement of which was in the hands of Dr. Chrystal, secured the first prize in its class and was awarded a gold medal. Another first prize was awarded to Mr. Bourne for the best working plan of a British woodland estate. An exhibit of bat-willow faults and diseases was put up at the Sussex County Show at Brighton, through the East Sussex Community Council, and at the Royal Show at Ipswich, as part of the Forestry Commission exhibit. Small entomological and mycological exhibits were also sent to Oundle School and Stowe School.

74. *Publications.* A list of publications issued during the year is given in Appendix I.

## VI. BUILDINGS.

75. During the year a Decree was passed by the University allocating a site within the Parks area for the erection of a new building for the Department of Forestry, including the Imperial Forestry Institute. Some progress has been made in regard to preliminary plans and estimates for the building, but it has not yet been possible to commence building operations owing to the lack of sufficient financial provision: this matter is receiving further attention.

## VII. FINANCE.

76. The detailed accounts of the Institute will be published, after audit, in the *Oxford University Gazette*. The following is a summary of income and expenditure for the year:—

*Income.* Crown Agents, £3,884; Dominions and others, £600; Forestry Commission, £3,078; Department of Scientific and Industrial Research, £267; Interest on Capital Account, £550; Other Receipts, £135. Total Income, £8,514.

*Expenditure.* Staff Salaries and Pension Contributions, £6,181; Instructional Supplies, £350; Travelling, £229; Administrative, £2,303; Miscellaneous, £71; Transfer to Information Branch, £166. Total Expenditure, £9,300.

R. S. TROUP, *Director,*

OXFORD.

*Imperial Forestry Institute.*

4th October, 1934.

## APPENDIX I

## PUBLICATIONS.

The following publications have appeared during the year:—

- BANCROFT, H. 'On Certain Fossil Plants from East Anglia.' (Annals of Botany, Vol. 47, 1933).  
 'External Leaf-Characters of the Cricket-Bat and other Willows.' (Nature, Vol. 133, 1934).  
 'An External Leaf-Character of the Cricket-Bat and other Willows.' (Journal of Botany, Vol. 72, 1934).
- BOURNE, R. 'Problems of Modern Forestry.' (Discovery, Vol. 15, 1934).  
 'Some Ecological Conceptions.' (Empire Forestry Journal, Vol. 13, 1934).
- BURT DAVY, J. 'The British Oaks.' (Quarterly Journal of Forestry, Vol. 27, 1933).  
 'Botanical Notes on Empire Trees, No. V: British Cameroons.' (Empire Forestry Journal, Vol. 12, 1933).  
 'Note on the Ayo and the Opepe of Nigeria.' (*Idem*, Vol. 12, 1933).  
 'An Early Record of the Sycamore Maple in Britain.' (Nature, Vol. 134, 1934).
- CHALK, L. 'Annual Rings in Transplants and Seedlings.' (Quarterly Journal of Forestry, Vol. 28, 1934).
- CHATTAWAY, M. M. 'Tile Cells in the Rays of the Malvales.' (New Phytologist, Vol. 32, 1933).  
 'Ray Development in the Sterculiaceae.' (Forestry, Vol. 7, 1933).  
 'Anatomical Evidence that *Grewia* and *Microcos* are distinct Genera.' (Tropical Woods, No. 38, 1934).
- CHRYSTAL, R. N. 'An Entomological Tour in Sweden, 1933.' (The Entomologist's Monthly Magazine, Vol. 70, 1934).
- DAY, W. R. 'Wind Damage on Scots and Corsican Pine.' (Quarterly Journal of Forestry, Vol. 28, 1934).
- DAY, W. R., and PEACE, T. R. 'Poplar Canker: a preliminary Note.' (*Idem*, Vol. 28, 1934).
- HOYLE, A. C., and DUNKLEY, L. H. 'New Trees and Shrubs from Tropical Africa, III.' (Kew Bulletin, 1933).
- MACDONALD, J. 'The Form of the Stem in Coniferous Trees, I.' (Forestry, Vol. 7, 1933).  
 'The Form of the Stem in Coniferous Trees, II.' (*Idem*, Vol. 8, 1934).

## OXFORD FORESTRY MEMOIRS.

- No. 15. '*Meria laricis*, the Leaf Cast Disease of Larch.' By T. R. Peace and C. H. Holmes. 1933.
- No. 16. 'The Experimental Production and the Diagnosis of Frost Injury on Forest Trees.' By W. R. Day and T. R. Peace. 1934.

## FOREST TREES AND TIMBERS OF THE BRITISH EMPIRE.

- No. 2. 'Twenty West African Timber Trees.' By L. Chalk, J. Burt Davy, H. E. Desch, and A. C. Hoyle. 1933.

## APPENDIX II

CLASSIFIED LIST OF BOTANICAL IDENTIFICATIONS  
MADE DURING 1933-34.

|                                                                    |                   |
|--------------------------------------------------------------------|-------------------|
| Gold Coast ... ..                                                  | 547               |
| Nigeria ... ..                                                     | 303               |
| Sierra Leone ... ..                                                | 222               |
| Uganda ... ..                                                      | 158               |
| Kenya Colony ... ..                                                | 141               |
| Tanganyika Territory ... ..                                        | 261               |
| Nyasaland ... ..                                                   | 556               |
| Northern Rhodesia ... ..                                           | 615               |
| Southern Rhodesia ... ..                                           | 268               |
| South Africa ... ..                                                | 69                |
| Zanzibar ... ..                                                    | 41                |
| Cyprus ... ..                                                      | 70                |
| Solomon Islands ... ..                                             | 24                |
| British Guiana ... ..                                              | 22                |
| British Honduras ... ..                                            | 95                |
| Forest Products Research Laboratory, Princes<br>Risborough ... ..  | 362               |
| Imperial Forestry Institute and various corres-<br>pondents ... .. | 662               |
|                                                                    | <hr/> 4,416 <hr/> |

## APPENDIX III

### LIST OF BOTANICAL SPECIMENS RECEIVED.

The following is a list of herbarium and wood specimens received, for which special acknowledgments are due :—

#### I. HERBARIUM SPECIMENS.

##### EUROPE.

*The British Isles*: Various correspondents, 240; Forest Products Research Laboratory, Princes Risborough, 218; Professor R. S. Troup, 10; Dr. J. Burt Davy, 922; Dr. L. Chalk, 1; Mr. W. R. Day, 17; Mr. T. R. Peace, 9; Mr. J. Macdonald, 9; Mr. P. G. Beak, 49. *France*: Professor R. S. Troup, 2. *Germany*: Dr. J. Mildbraed, 2. *Sweden*: Dr. Björn Floderus, 17.

##### ASIA.

*Cyprus*: The Conservator of Forests, Nicosia, 81. *India*: The Forest Research Institute, Dehra Dun, 1. *Malaya*: Mr. C. F. Symington, Forest Research Institute, Kepong, Selangor, 12; The Director, Botanic Gardens, Singapore, 36.

##### AFRICA.

*Belgian Congo*: Professor Dr. W. Robyns, Director of the *Jardin Botanique de l'État*, Brussels, 121. *Gold Coast*: The Conservator of Forests, Accra, 1; through Mr. D. Kinloch, 71; through Mr. C. Vigne, 204; Dr. F. R. Irvine, Achimota College, Accra, 113. *Kenya Colony*: The Conservator of Forests, Nairobi, 39. *Nigeria*: Mr. J. D. Kennedy, 170; Mr. W. D. MacGregor, 3; Mr. D. R. Rosevear, 150; Mr. J. E. Taylor, 25; The Director, Forest Products Research Laboratory, Princes Risborough, 42. *Nyasaland*: The Conservator of Forests, Zomba, 23; through Mr. J. E. A. Carver, 69; through Mr. R. G. Ross Townsend, 70. *Northern Rhodesia*: Mr. J. D. Martin, 124; Mr. R. G. Miller, 73. *Southern Rhodesia*: The Chief Forest Officer, Salisbury, 66; Mr. A. A. Pardy, 125; Mr. F. Eyles, 103; Miss E. C. Steedman, 9. *Sierra Leone*: The Conservator of Forests, Freetown, through Mr. C. V. Wallace, 148. *Sudan*: The Conservator of Forests, 3. *Tanganyika Territory*: The Conservator of Forests, Morogoro, 11; Mr. C. J. W. Pitt-Schenkel, 26; Mr. B. D. Burt, 55; Miss R. D. Bax, 197; The Director, Royal Botanic Gardens, Kew, 32; The Keeper of Botany, British Museum (Natural History), 3; The Director, Forest Products Research Laboratory, Princes Risborough, 7. *Uganda*: The Conser-

vator of Forests, Entebbe, 133; The Director, Royal Botanic Gardens, Kew, 51; The Director, Forest Products Research Laboratory, Princes Risborough, 5. *Union of South Africa*: The Conservator of Forests, Pretoria, 28; General Smuts, 2; Mrs. A. B. Gillett, 73. '*East Tropical Africa*': The Director, Royal Botanic Gardens, Kew, 148. '*Africa*': President Shantz, Tuscon University, Arizona, 48.

#### AMERICA.

*United States*: Dr. A. Rehder, Arnold Arboretum, Harvard University, 35; The Director, Field Museum of Natural History, Chicago, 125; The Head Curator, New York Botanical Garden, 324; The Associate Curator, Smithsonian Institution, 106; Mr. F. C. Williamson, Baltimore, Maryland, 1; Mrs. Anderson, California, 1; Miss F. Bolton, California, 8. *British Honduras*: The Acting Conservator of Forests, Belize, 75. *West Indies*: Mr. J. Edmund Clark, 25 from Montserrat; The Acting Conservator of Forests, Port-of-Spain, Trinidad, 26; Mr. R. O. Williams, Dept. of Agriculture, Port-of-Spain, Trinidad, 3.

#### AUSTRALASIA.

*Australia*: The Commonwealth Forestry Bureau, Canberra, 7; The Director, Technological Museum, Sydney, 25; The Director, Melbourne Botanic Gardens, Victoria, 33.

### 2. WOOD SPECIMENS.

Hand specimens for type collection:—

EUROPE. The Forest Products Research Laboratory, Princes Risborough, 40.

ASIA. *Malaya*: The Forest Research Institute, Kepong, F.M.S., 950; Mr. M. R. Henderson, Royal Botanic Gardens, Singapore, 11. *Japan*: Professor M. Fujioka, Tokyo Imperial University, Japan, 23. *China*: Mr. Y. Tang, Fan Memorial Institute of Biology, Peiping, 2.

AFRICA. *Gold Coast*: The Conservator of Forests, through Mr. C. Vigne, 178. *Uganda*: Forest Department, 114. *Sierra Leone*: Forest Department, through Mr. C. V. Wallace, 19. *Nigeria*: Forest Department, 7. *Sudan*: The Conservator of Forests, 3. *Tanganyika*: Mr. B. D. Burt, Tsetse Research Department, 1.

AMERICA. *United States*: Professor H. P. Brown, Syracuse University, 123; Professor S. J. Record, Yale University, 53. *British Honduras*: Forest Department, through Mr. R. S. Pelly, 15; through Mr. N. Stevenson, 35. *British Guiana*: Mr. J. Aiken, 11.

## APPENDIX IV

## CLASSIFIED LIST OF HERBARIUM EXCHANGES,

1933-34.

|                                                                                                        | Sent.             | Received.*      |
|--------------------------------------------------------------------------------------------------------|-------------------|-----------------|
| Arnold Arboretum (Dr. A. Rehder) ... ..                                                                | 154               | 35              |
| British Museum (Mr. J. Ramsbottom) ...                                                                 | 171               | 3               |
| Jardin Botanique de l'État, Brussels (Professor Dr. W. Robyns) ... ..                                  | 173               | 121             |
| Botanisches Museum, Berlin-Dahlem (Dr. R. Pilger) ... ..                                               | 82                |                 |
| Field Museum of Natural History, Chicago (Dr. S. C. Simms) ... ..                                      | 70                | 125             |
| Forest Research Institute, Dehra Dun (Mr. R. N. Parker) ... ..                                         | 56                |                 |
| Royal Botanic Gardens, Kew (Sir Arthur W. Hill) ... ..                                                 | 203               | 231             |
| New York Botanical Garden, Bronx Park (Dr. E. D. Merrill) ... ..                                       |                   | 324             |
| New York State College of Forestry, Syracuse (Professor H. P. Brown) ... ..                            | 99                |                 |
| Division of Plant Industry, Dept. of Agriculture, Pretoria, South Africa (Dr. I. B. Pole Evans) ... .. | 69                |                 |
| Botanic Gardens, Singapore (Mr. R. E. Holtum) ... ..                                                   | 86                | 36              |
| Smithsonian Institution, Washington, D.C. (Dr. W. R. Maxon) ... ..                                     | 96                | 106             |
| Yale University, School of Forestry (Professor S. J. Record) ... ..                                    | 168               |                 |
|                                                                                                        | <hr/> 1,427 <hr/> | <hr/> 981 <hr/> |

\* As detailed in Appendix III.

## PROSPECTUS

*Scope of Work.* The Institute is intended to provide courses of advanced study; its work comprises (1) post-graduate training of probationers for the forest services and other qualified persons, (2) training of research officers in special subjects, and (3) provision of courses for selected officers already serving.

The Institute does not undertake to provide a general training in Forestry such as is given at Universities or other centres where this subject is taught.

*Admission of Students.* Only persons falling within one or other of the following categories are eligible for admission to the Institute:—

- (a) Those possessing a Degree in Forestry or a Diploma or equivalent certificate of having satisfactorily completed an approved course of training in Forestry, who have been selected as probationers for the higher branch of some forest service;
- (b) Graduates with honours in Science who desire to become specialists in some branch of work connected with Forestry;
- (c) Forest officers deputed by their Governments to attend courses with the view of bringing their professional knowledge up to date;
- (d) Students of approved qualifications not included in the first three categories who are admitted on the recommendation of Overseas Governments.
- (e) Students with a University training in Forestry who may wish to attend the Institute on their own account and at their own expense.

*Note.*—No officer in any Public Service in the British Empire will be admitted to the Institute unless he is officially deputed by the Government under which he is serving; (2) the Board of Governors of the Institute reserve the right to refuse the admission of applicants other than nominees of contributing Departments and Governments.

*Names of applicants for admission should be sent, together with details of previous training and subjects which it is proposed to study, to the Director, Imperial Forestry Institute, Oxford, at least three months before the date on which it is proposed to join: the Director cannot undertake to consider applications received at shorter notice.*

*Terms and Vacations.* The academic year begins early in October, and is divided into the following Terms and Vacations:

Michaelmas Term (eight weeks, early October to early December).

Christmas Vacation (early December to middle of January).

Hilary Term (eight weeks, middle of January to middle of March).

Easter Vacation (middle of March to end of April).

Trinity Term (eight weeks, end of April to end of June).

Long Vacation (early July to early October).

*Courses of Study.* The courses of study are normally of three kinds:—

- (1) For post-graduate probationers who have not yet taken up their appointments: the course ordinarily extends over one academic year, beginning October, and including practical work in part of the Easter and Long Vacations.
- (2) For forest officers on leave, or others who propose to attend the Institute with the view of spending some time (normally one year) in specializing in some particular branch of work; the course of study will be adapted to individual needs, and will ordinarily begin in October.
- (3) For forest officers on leave who propose to spend part of the year only on 'refresher' courses. *These should attend during the spring and summer months, and not between October and January.* The distribution of work in the more usual subjects studied in 'refresher' courses is as follows:—

*Silvicultural Systems:* Trinity Term, with Continental tours in Easter and Long Vacations (middle of March to middle of September).

*Methods of artificial regeneration:* Hilary and part of Trinity Terms and Easter Vacation (middle of January to end of May).

*Forest Management, Regional Survey, Stocktaking and Working Plans:* Easter Vacation, Trinity Term and Long Vacation (middle of March to middle of August).

*Tropical Silviculture:* Trinity Term (end of April to end of June).

*Surveying:* Trinity Term (end of April to end of June).

*Forest Utilization and Engineering:* (1) Special work in timber mechanics, and wood seasoning and preservation at the Forest Products Research Laboratory, Princes Risborough, can be arranged at any time throughout the year.

(2) *Road project*: Trinity Term (end of April to end of June).

*Systematic Botany*: (1) *Full course*: three Terms (middle of October to end of June).

(2) *Short Courses*: (a) two Terms—Hilary and Trinity (middle of January to end of June); or (b) one Term, Hilary or Trinity.

*Continental Tours*: Easter and Long Vacations.

Persons wishing to join Continental tours are reminded that their visits should coincide with the normal tours arranged in the Easter and Long Vacations (*i.e.* the middle of March to the end of April, and early July to early October). Neither the Institute nor any member of its Staff is authorized to arrange visits or to furnish introductions on behalf of persons desiring to visit Continental centres on their own account.

*Subjects of a more special kind*, such as Entomology, Mycology, Wood Structure, Methods of Ecological Survey, Soil Properties, etc., can be studied at times to be arranged to suit individual requirements, provided notice of not less than three months is given.

*Fees*. An inclusive fee of £75 will be charged for instruction for one whole year at the Institute. If the course of studies extends over less than one year, the fees charged will be £25 per Term and £1 per week for tours in the Vacations. These fees will include all charges for instruction both at Oxford and on tour, as well as for the use of apparatus, materials, library, etc.; they will not include living and travelling expenses. Reduced fees may be charged in individual cases, at the discretion of the Director, to students attending the Institute at their own expense who do not belong to any Public Service.

No fees will be charged to students deputed by Governments and Departments which contribute to the funds of the Institute.

*Expenses*. Living expenses at Oxford during Term are roughly estimated at from £3 10s. to £4 10s. a week. Expenses on the Continent vary considerably with locality and other factors.

*Membership of the University*. Students of the Institute may, at their own discretion and if possessed of the necessary qualifications, be matriculated as members of the University; particulars regarding admission, expenses, etc., are given in a pamphlet entitled *General Information concerning Admission, Residence, etc.*, obtainable (post free 6½d.) at the Clarendon Press Depot, High Street, Oxford. Students becoming members of the University will be eligible for the Diploma in Forestry on fulfilling the conditions laid down by the University Statutes.

## PUBLICATIONS ISSUED BY THE IMPERIAL FORESTRY INSTITUTE

### OXFORD FORESTRY MEMOIRS.\*

1. The Relation between Height Growth of Trees and Meteorological Conditions. By W. E. Hiley and Norman Cunliffe. 1922. 3s. 6d.
2. Soil Acidity and its Relation to the Production of Nitrate and Ammonia in Woodland Soils. By G. R. Clarke. 1924. 3s. 6d.
3. The Watermark Disease of the Cricket-bat Willow (*Salix caerulea*). By W. R. Day. 1924. 3s. 6d.
4. Measurements of the Cubical Contents of Forest Crops. By M. D. Chaturvedi. 1926. 10s. 6d.
5. The Physiography of Southern Nigeria and its Effect on the Forest Flora of the Country. By J. R. Ainslie. 1926. 4s. od.
6. The Financial Return from the Cultivation of Scots and Corsican Pines. By W. E. Hiley. 3s. 6d.
7. The Gold Coast Forest: A Study in Synecology. By T. F. Chipp. 1927. 10s. od.
8. The Forest Industry of Finland. By W. E. Hiley. 1928. 4s. 6d.
9. Aerial Survey in Relation to the economic Development of new Countries, with special Reference to an Investigation carried out in Northern Rhodesia. By R. Bourne. 1928. 7s. 6d.
10. Formation of Spring and Summer Wood in Ash and Douglas Fir. By L. Chalk. 1930. 6s. od.
11. Studies of the Sirex Parasites. By R. N. Chrystal. 1930. 5s. od.
12. The Plasticity of the Root System of Corsican Pine in early Life: Researches designed to facilitate the Establishment of this Tree in Great Britain. By R. N. Aldrich-Blake. 1930. 6s. od.
13. Regional Survey and its Relation to Stocktaking of the Agricultural and Forest Resources of the British Empire. By R. Bourne. 1931. 15s. od.

14. The Fixation of atmospheric Nitrogen by Bacteria living symbiotically in Root Nodules of *Casuarina equisetifolia*. By R. N. Aldrich-Blake. 1932. 3s. 6d.
15. *Meria laricis*, the Leaf-Cast Disease of Larch. By T. R. Peace and C. H. Holmes. 1933. 4s. od.
16. The Experimental Production and the Diagnosis of Frost Injury on Forest Trees. By W. R. Day and T. R. Peace. 1934. 6s. od.
17. The Physiography and Vegetation of Trinidad and Tobago. A Study in Plant Ecology. By R. C. Marshall. 1934. 6s. od. (In the press).
18. The Silviculture of the Mixed Deciduous Forests of Nigeria. By W. D. MacGregor. 1934. 15s. od. (In the press).

#### OXFORD MANUALS OF FORESTRY.\*\*

Silvicultural Systems. By R. S. Troup. 1928. 21s.

The Economics of Forestry. By W. E. Hiley. 1930. 21s.

#### FOREST TREES AND TIMBERS OF THE BRITISH EMPIRE.\*

1. Some East African Coniferae and Leguminosae. By L. Chalk, J. Burt Davy and H. E. Desch. 1931.
2. Twenty West African Timber Trees. By L. Chalk, J. Burt Davy, H. E. Desch and A. C. Hoyle. 1933. 7s. 6d.

#### MISCELLANEOUS.

Handbook of Conifers grown in the Arboretum, Bagley Wood, Oxford.\* By J. Burt Davy. 1926. 2s. od.

Collection and Preparation of Herbarium and Timber Specimens. By J. Burt Davy and L. Chalk. 1928. 8d.

Exotic Forest Trees in the British Empire.\*\* By R. S. Troup. 1932. 20s.

Natural Woodlands of Britain and Ireland.\* By M. L. Anderson. 1932. 9d.

\* To be purchased from the Librarian, Imperial Forestry Institute, Oxford. Postage extra.

\*\* To be purchased from the Clarendon Press, Oxford. Postage extra.



